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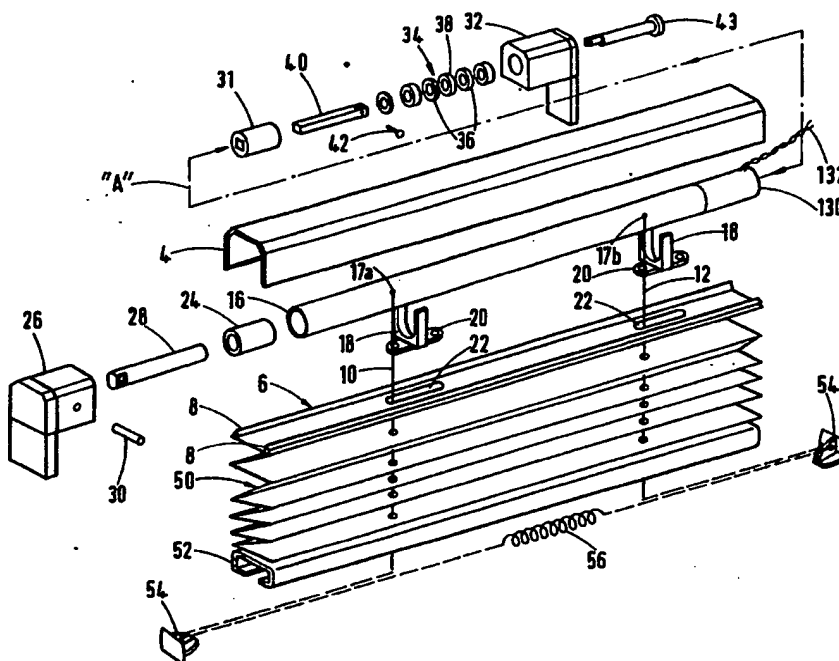
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(54) Title: WINDOW BLIND OR CURTAIN, PARTICULARLY FOR TWO-PANE INSULATING GLASS WINDOW

(57) Abstract

A window blind, pleated curtain or the like, suspended in a cord drive system mounted in a housing, adapted to be positioned between the glass panes in a double glass window, particularly an insulating glass window. The cord drive system is connected with a laterally arranged, longitudinal support shaft (16), mounted in the housing, which support shaft (16) is arranged rotatable as well as laterally displaceable in axial direction in order to accomplish winding and unwinding of the cord drives (10, 12; 66, 68; 78, 78') in one single layer along parts of the support shaft, in order to hoist or lower the blind, respectively. The support shaft (16) is provided with threads in engagement with a threaded member (24, 28), which is not rotatably connected in said housing (2), effecting that said support shaft (16) by rotation synchronously is being moved in axial direction.



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"Window blind or curtain, particularly for two-pane insulating glass window".

The present invention relates in general to hoistable and lowerable window blinds or curtains, designed and adapted for mounting between the glass panes in double glass pane windows, particularly for double glass insulating window units. The invention can be utilized for venetian blinds of the type having individual, vertically mutually spaced slats, as well as for blinds of the pleated type, providing a continuous screen or curtain.

For the sake of simplicity, one shall for the various types of blinds and screens which fall within the scope of the invention, in the following specification including the claims, as general designation for the products involved use the word "blinds", unless a different word is used to designate a particular product.

A number of various proposals for such blinds is known. As illustrative for the prior art, one can refer to US patents 3.292.309, 3.153.819, 2.530.218, 4.459.778 and 3.835.911.

To make various types of blinds designed for mounting between two fixedly mounted glass panes, such as between two panes of glass in an insulating window unit, offers a number of special problems. Firstly, the available space, in transverse direction, for mounting the blind unit is rather limited, and further, the blind structure must have a rather durable, operationally reliable and maintenance free construction, inasmuch as the blind unit including the system for hoisting and lowering the blind is not readily accessible for repair or replacement, but instead normally will require replacement of the entire window unit if malfunctions should occur. Furthermore, the blind must be simple and durable in operation by unskilled inhabitants of the building in question.

The main object of the invention has thus been to provide a rather compact, mechanically simple and durable blind unit

for mounting between the double glass panes in insulating glass window units and the like.

A further object for the invention is to provide a constructional solution which makes possible hoisting as well as lowering of the blind, and also an angular positioning of the separate slats in connection with the blind having individual slats.

A further object for the invention is to provide a solution making it possible to operate the blind with one single operational means, in other words, a blind which can be manually operated with one single hand.

A further very important object of the invention is to provide a suspension system including a cord suspension or drive, which can be given a rather compact construction, such that the solution is especially adapted for mounting between the glass panes in an insulating glass pane window.

A still further object for the invention is to provide a solution which makes it possible to arrange a forced or mechanically controlled two-way hoisting and lowering of the blind. A such solution may be desirable for several reasons, namely firstly because a such blind solution is very well adapted for mounting between two pane glasses which are having a position tilted from the vertical position, for instance in connection with glass roofing or the like, solutions which today are increasingly in use. Such solutions offer furthermore an added operational reliability in addition to that the occurrence of sound creations due to contact between the blind and the inside surface of the glass panes may be avoided.

The window blind structure in accordance with the invention is of the kind provided with a cord suspension drive, which is mounted in a housing, and which is particularly adapted to be positioned between the glass panes in a double glass pane window, particularly an insulating glass window, and whereby the blind is suspended in a cord drive or the like, by means of which the blind can be positioned in any desirable position relative to the window area, and the blind structure in accordance with the invention is generally characterized in that the cord suspension drive is connected to an elongated,

transversely positioned support shaft, mounted in a housing, which shaft is arranged for rotating movement as well as being axially displaceable, operative to providing winding and de-winding of the cord drives connected to the shaft, substantially in one single layer along the support shaft.

In a preferred embodiment of the invention, the support shaft is provided with inwardly (hollow shaft) or outwardly positioned screw threads which stand in threaded connection with one or more threaded elements, which are fixedly attached in the housing, resulting in that the support shaft by rotation simultaneously is being moved in axial direction.

The solution in accordance with the invention for suspending or mounting and manoeuvring of window blinds, can be utilized in a number of various designs of window blinds of the type having individual slats, and blinds of the pleated type with accordion-like interconnected slats.

One embodiment of the invention, which can be utilized on different types of blinds, is characterized in that the cord drive consists of one single continuous cord, the respective ends of which are fixed to the support shaft in mutually laterally spaced positions, the cord running from one first fixed point on the shaft down through the blind on one side of same to a list or rail, arranged at the bottom of the blind, along said rail by means of sliding means or the like, mounted on both sides of the rail, and from there with a cord section leading up through the blind to one on the support shaft arranged, second fixed point for the other end of the cord.

A second embodiment of the invention, which is particularly useful in connection with window blinds of the pleated type, is characterized in that the blind is suspended in two independent cord drive systems, each of which consists of a single cord, and in that the respective ends of each cord drive is attached on respective opposite sides of the support shaft relative to its longitudinal axis, having parallel cord runs which are running down through the blind and at the lower window frame element, for instance on a lower spacer element, runs in a 360° loop via transition means, and in that one of the cord runs in each of the cord drives is attached to an

attachment point at the lower edge of the blind, having the effect that each cord run in each cord drive during the rotational movement of the shaft will be simultaneously wound and unwound from the shaft to the same extent, preserving a constant free length of the cord drives and the tension in same, simultaneously as the blind will be hoisted up or down in correspondence with the rotational direction of the shaft, having the effect that the movements of the blind will take place in a mechanically speaking controlled way in both directions.

A further embodiment of the invention, which is particularly useful in connection with blinds of the type consisting of individually suspended slats, is characterized in that the blind is suspended in two cord drives, namely one system for lowering and hoisting of the blind, and one second cord drive system for angular positioning of the individual slats, and this solution is generally characterized in that the cord drives for angular positioning of the slats, are limited slidably connected with the support shaft. Hereby, the support shaft may, by rotation, be utilized for hoisting and lowering of the blind as well as for obtaining the desired angular positioning of the separate slats.

A known problem in connection with the mounting of blinds with cord drives, positioned between glass window panes in insulated glass windows, is that the accessible space is rather limited, implying that it is very difficult to design sufficiently effective and durable cord drive mechanisms. In accordance with some proposals, one has attempted to build in the cord drive system in the spacer element. Such solutions have not been successful. In other proposals, one has therefore mounted the cord drive mechanism in special housings, which are positioned below the spacer element in the window. A drawback with such solutions is, however, that the effective light area in the window thereby is reduced. A further important feature of the invention in this connection is that one is utilizing an especially designed spacer element, which consists of two parts, namely a base part or inside part, which constitutes the support for the blind including the cord drives, and a top part

or external part, which serves as a cover and which is positioned on the support part subsequent to that the cord drive systems have been mounted therein, resulting in that the cord drive mechanisms are confined in a closed box profile element. In connection with the invention, one is furthermore utilizing special corner elements, which in addition to providing a closure for the end parts of the box profile element, also serves as support means for the adjacent spacer element in the window on either side. The mentioned two-part box profile element for the cord drives constitutes thereby simultaneously the spacer element for the insulated glass window. This is accomplished by the rather compact design of the cord drive mechanisms in accordance with the invention. For operation of the cord drive mechanism, one can use a solution where the drive shaft or an extension of same is extended out sideways through one of the corner elements in order to be connected to a motor drive or an manual mechanism positioned on the outside of the window, or on the adjacent frame or wall. Alternatively, the cord drives can be operated by means of an electric motor which can be designed in order to constitute an integral part of the support shaft.

Some embodiments for window blinds in accordance with the invention shall in the following be described in detail, with reference to the accompanying drawings, wherein:

fig. 1 is showing a fragmentary or exploded perspective view illustrating the construction of a pleated window blind in accordance with the invention, and particularly illustrating the design of the main parts of the cord drive mechanism.

Fig. 2 and 3 are showing a front view and an end view of a pleated window blind, respectively, which has substantially the same construction as the blind shown in fig. 1, but which has an alternative solution for the cord drive system, whereby is obtained a mechanically forced movement of the pleated blind from a closed to an open position.

Fig. 4 is showing a fragmentary perspective view, similar to fig. 1, of a second embodiment of the invention, wherein is used a window blind of the type made up by slats, i.e. individual plates or lists, and wherein the cord drive mechanism is such

devised that one can obtain hoisting and lowering of the blind as well as rotation or angular positioning of each separate slat by means of one single manual maneuvering means,

fig. 5 is a detail view shown in an enlarged scale, which perspectively and in detail illustrates the cord drive mechanism utilized with the blind shown in fig. 4,

fig. 6 is a schematic view which in a cross-sectional plane illustrates an alternative detail solution for the angular adjustment of the slats used in the blind shown in fig. 3,

fig. 7 is a perspective detail view, shown in an enlarged scale, of a special corner piece on the profile element for mounting the cord drive mechanism.

The cord drive system in accordance with the invention shown in fig. 1, is based upon the use of a longitudinal extending combined support and rotational shaft 16, which for all practical purposes extends transversely all the way from one side of the window to the other side, and which together with the cord drive is built into a two-part box shaped profile element 2, consisting of a top part or cover 4 and a basis part 6, and which suitably is such configured that the cover 4 can be snapped onto the basis part 6 which in this connection is provided with a suitable longitudinal groove 8 on either side. The cord drive consisting of support cord sections 10 and 12 has one end fixed to the shaft 16, which shaft is supported in two or more saddle shaped bearings 18, 18, mounted on the basis part 6 of the profile elements. The cords 10 and 12 extend through apertures 20 and further down through elongated slits 22, 22 in the basis part 6 of the profile element.

At one end, the support shaft 16 is attached to an inwardly screw threaded drive element 24. Outside the end of the shaft 16, is arranged a corner piece 26 wherein is supported a not rotatable, screw threaded stem 28, provided with an aperture through which is positioned a locking spline 30. The aperture has greater diameter than the spline, such that the stem 28 is somewhat loosely supported.

The shaft 16 is by means of the screw threaded drive element 24 standing in threaded engagement with the stem 28.

The parts which are positioned at the other end of the shaft, i.e. the right side in the figure, are shown separately in a fragmentary view positioned above the shaft, and are for the sake of clarity indicated with a stitched line designated with the letter "A".

At the other end of the shaft 16 is attached a bushing 31, having a square aperture 32. The bushing 31 is attached in a such way that it cannot rotate relative the the shaft 16.

In the right side corner piece 32, which is provided with a throughgoing aperture, is positioned a packing/sealing unit consisting of two bearing rings 34, and further two special gaskets 36, and finally distance piece 38. The support shaft 16 extends through the corner piece 32, and at the outer end of the shaft, which is available on the outside of the insulated glass window, is arranged a groove with a rotation means adapted for connection to a manual or electric operation mechanism which thereby extends into the inside of the window, thereby enabling operation of the window blind. These implements, which may be of in per se known construction, are assumed to be unnecessary to show and describe.

The support shaft 16, and a square shaft 40, are coupled together with a locking spline 42. The square shaft 40 extends into a bushing 31, having a square aperture.

When the shaft 43 is imparted a rotational movement, the movement is transferred to the support shaft 16. By means of the screw drive 24 and the stem 28, the support shaft 16 is simultaneously imparted an axial movement. Inasmuch as the cords 10 and 12 are fixed to the shaft 16, and further, in that the cords are guided through the openings 20, 22 in the bearings 18, 18, the combined rotational/axial movement of the shaft 16 is effecting that the cords are being winded on or dewinded in parallel fashion in one single layer on the support shaft, simultaneously as the cords will maintain their vertical position relative to the apertures 20, 22.

The upper end of the pleated blind 50 is attached to the underside of the base plate 6 in the box shaped profile element, and the bottom or lowermost part of the pleated blind is attached to a bottom rail 52. The drive cords 10 and 12

extend from the shaft 16 down through the apertures 20, 22, and then further down through apertures made in each of the slats in the accordion like pleated blind, and from there down to the bottom rail 52, whereat the cords are passing over not shown slide members 89 and from these out to the opposing side edges of the bottom rail 52 out to terminating members 24 likewise provided with slide members or the like (the slide members 54 are in the figure shown in not mounted position for the sake of clarity). The cords run from there as shown, back to the center portion of the pleated blind, at which point the two cord ends are attached together via a spring 56 serving as a combined tension means and shock absorber. By arranging the cord drives in this fashion, the blind will be self-adjusting inasmuch as each time the blind is being lifted up to the uppermost position in the shape of a folded package below the basis element 6, possible maladjustments in the pleated blind will be re-adjusted.

Figures 2 and 3 are showing a front view and an end view, respectively, of a modified embodiment for a pleated blind in accordance with the invention. The cord drive system, including the simultaneously rotating and longitudinally moving support shaft 16 together with the parts which are shown in the uppermost part of fig. 1, corresponds to the construction shown at the top of fig. 1, while the embodiment shown in fig. 3 relates to an alternative cord drive mechanism. The two corner pieces 32 and 26, as also shown in fig. 1, are attached to spacer elements 60, 62, positioned on each side of the insulated glass window, respectively, and which spacer elements at the bottom ends are attached to the lowermost positioned spacer element 64. The embodiment shown in fig. 2 and 3 constitutes a special embodiment or further development of the solution shown in fig. 1, since here are utilized double or two couples of cord drives, respectively designated 66, 66' and 68, 68'. Both ends of each cord drive or cords are however in this embodiment attached to the shaft 16 on the opposite side of same, and furthermore on the opposite sides of the bearings 18 and 20. Through this arrangement, the cord drives 66, 66'; 68, 68' will thereby always be winded and dewinded on the support shaft

simultaneously in opposite direction. The cord drives extend from the support shaft 16 down through apertures 70, 70' on either side of the bearings 18, 18. The cord drives or runs 66, 68 continue from here down through apertures in the blind, through holes 72, 72' in the bottom rail 52, and from there down to slide members 74, 75 or the like, positioned in special turning or reversing members 76, 76 mounted on the spacer element 64. One of the two cord drives or runs, for instance, cord drive 68, 68', is attached to the bottom rail 52. During rotation of the shaft, the two cord drives or cord runs in each cord drive will thereby be winded and dewinded simultaneously in opposite directions, simultaneously as the blind via the attachment point 71, 71 moves up or down. One has, in other words, provided a positive or mechanically guided winding and unwinding of the window blind. During the assembly of the various parts, one sees to it that the cord drives are adjusted with a suitable tension, so that the blind is not given a chance to contact the inside of the glass panes, even if the same are mounted in a tilted position. This embodiment is therefore particularly suitable for insulated glass windows, which shall be mounted at an angle relative to the vertical plane.

Fig. 4 is showing a fragmentary perspective view, similar to fig. 1, of a further embodiment of the invention, where, in replacement of a window blind in the shape of a pleated curtain, is utilized a blind consisting of individual slats or foils 77, suspended with suitable mutual vertical distance, by means of couplewise cords or cord system 80, 80'; 82, 82', interconnected at each separate slat by means of transverse connecting cords. All parts of these cord drive systems, except for the cord drives and the blind, correspond to the construction shown in fig. 1, and requires no repeated description, since in fig. 4 are utilized the same reference numbers on the same parts, as appearing in fig. 1. At each lateral side of the blind is on the support shaft 16 further provided cord drives 78, 78', the one end of which is attached to the support shaft at the points 79, 79', and extend down through apertures provided in each separate slat, and the other lower end of the

cord is attached to the bottom rail 58. During rotation of the support shaft 16, the cord drive will be winded on, respectively dewinded off the support shaft, simultaneously as the support shaft is laterally displaced effecting that the cord drives as shown will be winded, respectively dewinded, in one single layer on the support shaft 16.

The special novelty of the blind solution in accordance with the invention shown in figures 4 to 6, relates to the suspension of the blind in order to adjust the angular position of the slats, and thereby the light opening in the window, in a simple and practical fashion. For rotating or pivoting of each of the slats, the same are in known fashion suspended in couplewise cord drives 80,80', wherein one cord extends along opposite side edges of the slats, and the cords are, as previously mentioned, suitably connected with lateral cords 84, forming support for each separate slat 77,77, as shown in fig. 6, so that the desired pivoting of the slats can be effected by providing an uneven or different pulling in each respective cord.

In accordance with the invention, the cord couple or couples 80,80' and 82,82', respectively, are arranged in a loop 86 extending around the support shaft, as best shown in fig. 5, which in a perspective view illustrates one of the suspension systems, for instance the left shown in fig. 4. The support shaft 16 is supported in a cradle-like bearing 88. The bearing cradle is provided with an circumferential slit 90, forming support for a slide ring 92, encompassing the support shaft and making possible a rotation of the support shaft and a displacement of same longitudinally, while the slide ring may be remaining immovable, i.e. it would not rotate together with the support shaft.

A preferred embodiment of the loop is shown in fig. 6, showing a schematic cross-section, viewed against the bearing cradle 88. The shown loop 100 can consist of a suitable flexible material, for instance a textile material, plastics or possible metal, and it is as shown arranged in a loop 100, extending over the support shaft 16, or as shown along the said slide ring 92. The downwardly directed ends of the loop are

guided through openings 102,102 in the bearing cradle 88 and adjacent openings 104 in the support profile 6 and are on the underside terminated with stoppers 106,106 simultaneously forming attachment points for the upper ends of the suspension cords 80,80'.

The suspension system for the blind shown in figures 4 to 6, functions in the following way. When the support shaft is put into rotation, the cord drives 78,78' are wound or unwound on the support shaft, depending upon the rotational direction of the shaft, as best shown in fig. 5, and the cord drives will be arranged in one single layer, because the support shaft simultaneously is being displaced laterally by means of the screw spindle 28 standing in engagement with the worm gear 24 mounted at the end of the support shaft as shown in fig. 4. Simultaneously, the loop 100 will follow the support shaft 16 in the one or in the other direction, depending upon the rotational direction of the support shaft, until one of the stoppers 106 hits and is biased against the underside of the profile element 6, simultaneously as the slats of the blind are pivoted to a closed position of the blind in the one or in the other direction. At the moment when one of the stoppers 106 hits the underside of the profile 6, the stopper 106 and/or the slide ring 92 will slide on the shaft 16. When it is desirable to position the slats in a more or less horizontal position, the support shaft is put into a very short rotational movement in the opposite direction, having the effect that the loop 100 will follow the support shaft through a slight movement in the opposite direction, such that the slats may be put into a horizontal position or in any other desirable angular position. When using a slide ring, the loop may be attached to the slide ring. When it is desired to hoist up the blind completely, one initiates the required winding action of the support shaft, whereby the slats at the end of the hoisting movements will be stacked together to a package positioned below the basis plate 6 of the profile element. In order to prevent that the support shaft continues to rotate subsequent to the blind having been completely hoisted up and stacked together, a friction coupling is suitably provided between the support shaft and the drive

means, which may be a manual device or an electric device. The special novelty in this technical design is that a blind consisting of individual slats can be operated, i.e. be lifted and lowered, as well as being angularly positioned, by one single manoeuvring means, namely the support shaft 16.

Fig. 7 is in an enlarged scale showing a perspective view of a preferred embodiment of a corner piece 110 to be used in connection with the special two-part profile element, which is used for assembling the cord drive systems in accordance with the invention. The corner piece 110 is provided in the shape of an angular profile element, having an upper arm 112, adapted for being pushed into the profile element when the same is assembled, and a lower arm 114 pushed into the spacer element on the other side of the window (not shown). The corner section 116 of the corner element is provided with a recess 118 adapted to receive a cover 120 for covering the outside end 122 of the transition shaft 43 (see fig. 1), which is provided with a suitable engagement means 124, adapted to be coupled to an electric motor or a manual drive mechanism. The cover is on the inside provided with a finger 126 adapted for engagement with the drive means 122, so that the support shaft 16 with the cover cannot rotate during storage and transport.

A window blind in accordance with the invention can be operated either by means of an external drive means, with can be operated manually, or by means of an electric motor. An electric motor can, however, be realized as an integral part 130 of the support shaft such as indicated at the right side of fig. 1. The right side of the support shaft including the motor can be mounted not rotatable at the right corner piece, simultaneously as the drive shaft of the motor (not shown) is put into engagement with one end of the adjacent end part of the support shaft. The wire 132 for supply of electric power to the motor can be arranged out through the right corner piece and extend to an electric power source, for instance a battery or to the regular city power wiring.

P a t e n t c l a i m s

1. Window blind particularly adapted to be installed between the glass panes in a double glass window, particularly an insulating glass window, provided with a cord drive system or the like, operable to position the blind in desired position in the window,

c h a r a c t e r i z e d in that the cord drive system is connected with a laterally arranged, longitudinal support shaft, positioned in a housing, which support shaft (16) is rotatable as well as axially displaceable in order to accomplish winding and unwinding of the cord drive systems (10,12;66,68;78,78') substantially in one single layer along parts of the support shaft.

2. Window blind in accordance with claim 1,
c h a r a c t e r i z e d in that the support shaft (16) is provided with screw threads which in operative position stand in screw thread engagement with a screw threaded member (24,28), which is not rotatably connected in the housing (2), effective to that rotational movement of the support shaft (16) will take place synchronously with an axial movement of the support shaft.

3. Window blind in accordance with claim 1,
c h a r a c t e r i z e d in that the cord drive consists of one single continuous cord (10,12), the respective ends of which are attached to the support shaft (16) at laterally positioned attachment points, said cord (10) running from one first attachment point (17a) on the support shaft down through the window blind on one lateral side of same, to a list or rail element (52) constituting the lowermost part of the blind, laterally along said rail (52) by means of transition slide means or the like (54,54) arranged on both lateral sides of the rail, and from there with a cord run (12) up through the window blind to one second attachment point (17b) on the support shaft.

4. Window blind in accordance with claim 1 or 2,

c h a r a c t e r i z e d in that the blind is suspended in at least two independent cord drive systems (66;68), each consisting of one single cord (66,66'; 68,68'), and in that the two respective ends of each of said cords (66;68) are attached on respective opposite side of said support shaft (16) relative to its longitudinal axis, and having parallel cord runs extending down through the blind, said cord at the lowermost part forming a loop situated at the bottom part of the window, for instance in the vicinity of a lower spacer element (64), said cord loop placed in a 360° loop on transition means (74;75), one of said cord runs in each cord drive being attached at an attachment point located at the lower edge of the window blind, having into effect that the cord runs in each cord drive system during rotation of the support shaft, will be simultaneously winded and dewinded equally, preserving a constant effective free length of each cord drive and also the initial tension in the cords, simultaneously as the window blind will be hoisted up or lowered in correspondence with the rotation of the support shaft, effecting that the movements of the window blind will take place in a mechanically controlled fashion in both directions (fig. 2).

5. Window blind in accordance with claim 1 or 2, particularly for use in connection with window blinds of the type consisting of individual slats, which are suspended in two or more cord drive arrangements, each of which consists of two, mutually separated, in couples arranged cord means, provided with supports for the slats, and which, by carrying out an unequal hoisting or pulling movement, can accomplish a pivoting of each separate slat in order to adjust the light passage through the blind,

c h a r a c t e r i z e d in that said, in couples arranged, laterally positioned cord drives for adjustment of the angular position of the slats, at their upper ends are slidably supported on the support shaft (16).

6. Window blind in accordance with claim 5,

c h a r a c t e r i z e d in that the two cord runs (80,80') of each cord drive at their upper ends are arranged in a loop which is placed slidably around the upper part of the support shaft (16).

7. Window blind in accordance with claim 5,
c h a r a c t e r i z e d in that the ends of said in couples arranged cord runs (80,80') uppermost are connected with a special, flexible element (100) which rests slidably across the support shaft (16), which element (100) is provided with means (106,106) at the ends which provide a limitation of the sliding movement in each direction.

8. Window blind in accordance with claim 1 or 2,
c h a r a c t e r i z e d in that said housing (2) comprises a spacer element in an insulating glass window, said housing (2) being composed of two parts, namely a substantially plate shaped support element (6) adapted to provide support for the bearings (18) for the support shaft (16), and one second part configured as a substantially U-shaped cover element (4), which is attached to the basis element (6) and forms an external element of the spacer element, said basis element (6) provided with apertures (22) for passage of the cord drive systems.

9. Window blind in accordance with any of preceding claims.
c h a r a c t e r i z e d in that said housing (2,4,6) at each corner part of the window, is furnished with special angularly shaped corner pieces (110), adapted for serving as transition members between said housing (2) and the spacer elements in the window on each side, which corner piece serves for additional support of said shaft (16), one of said corner pieces also serving as an air tight or sealed passing through of an extension of the drive shaft connected to the support shaft (16).

10. Window blind in accordance with any claims 1-8,
c h a r a c t e r i z e d in that said support shaft (16) includes a built-in electric motor (130).

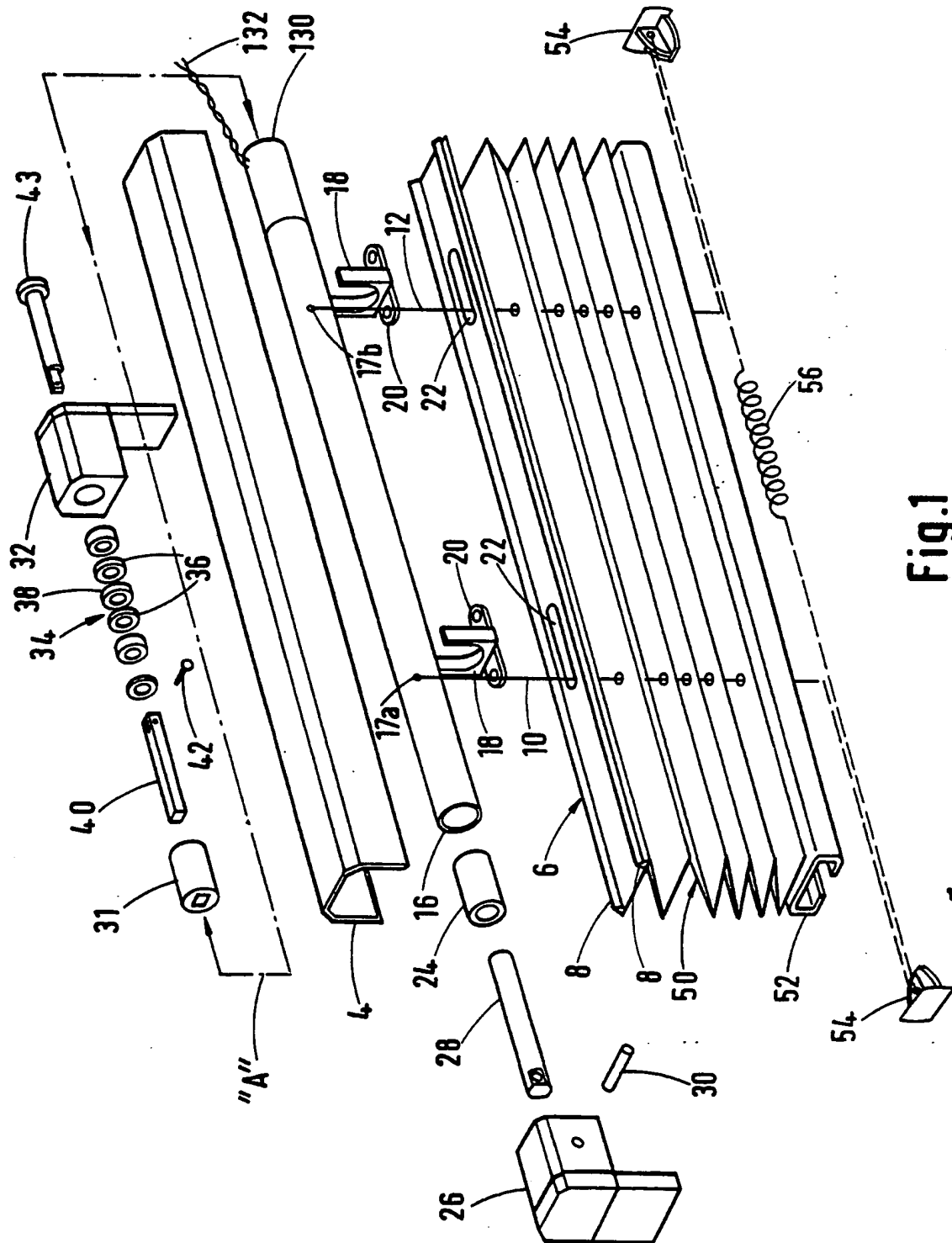


Fig.1

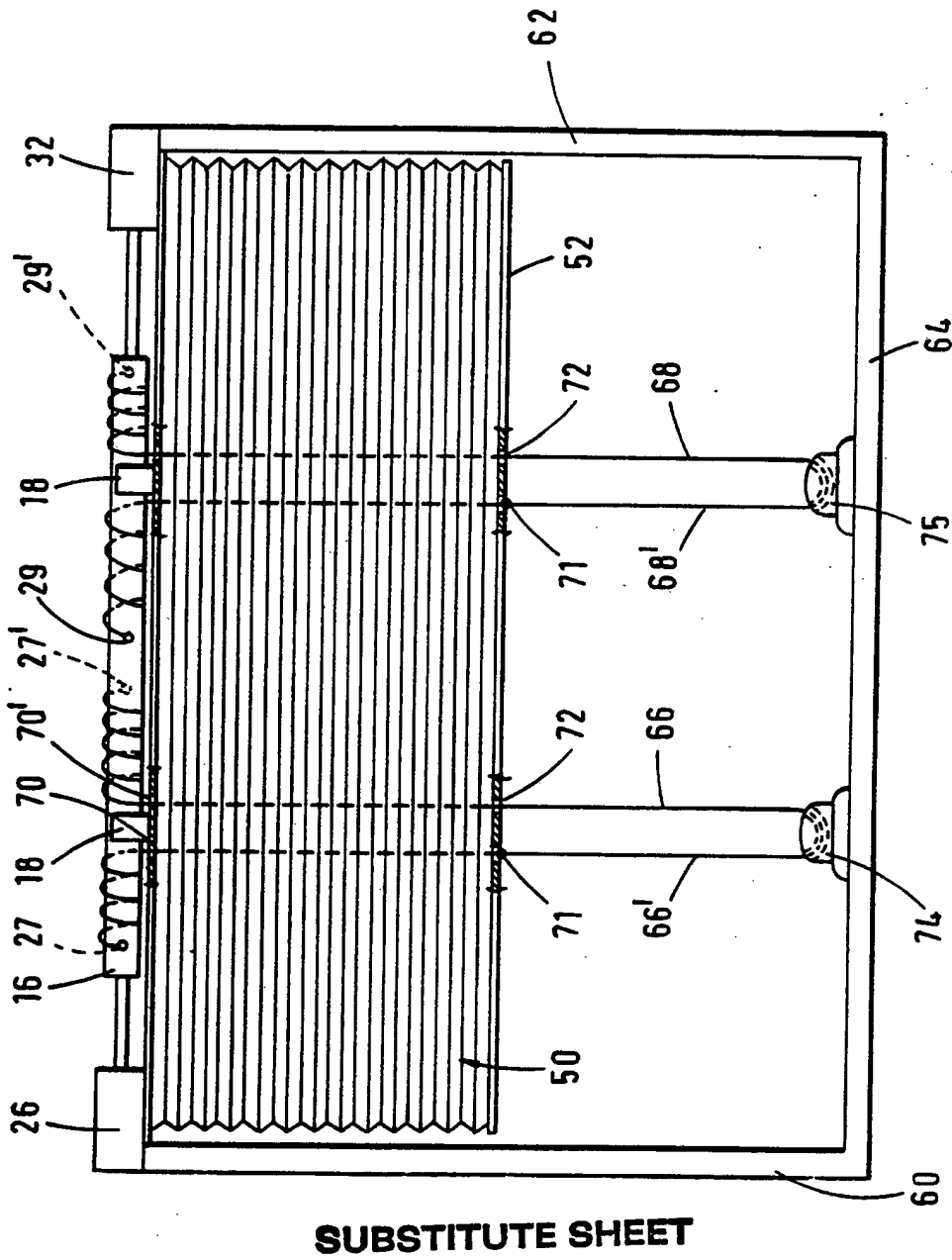


Fig. 2

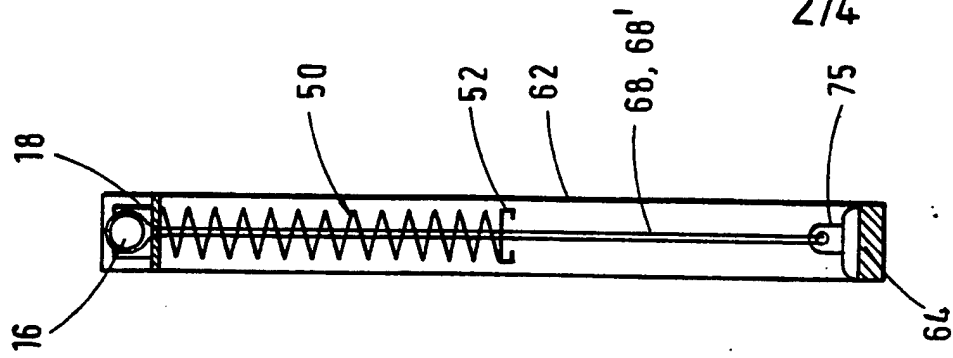


Fig. 3

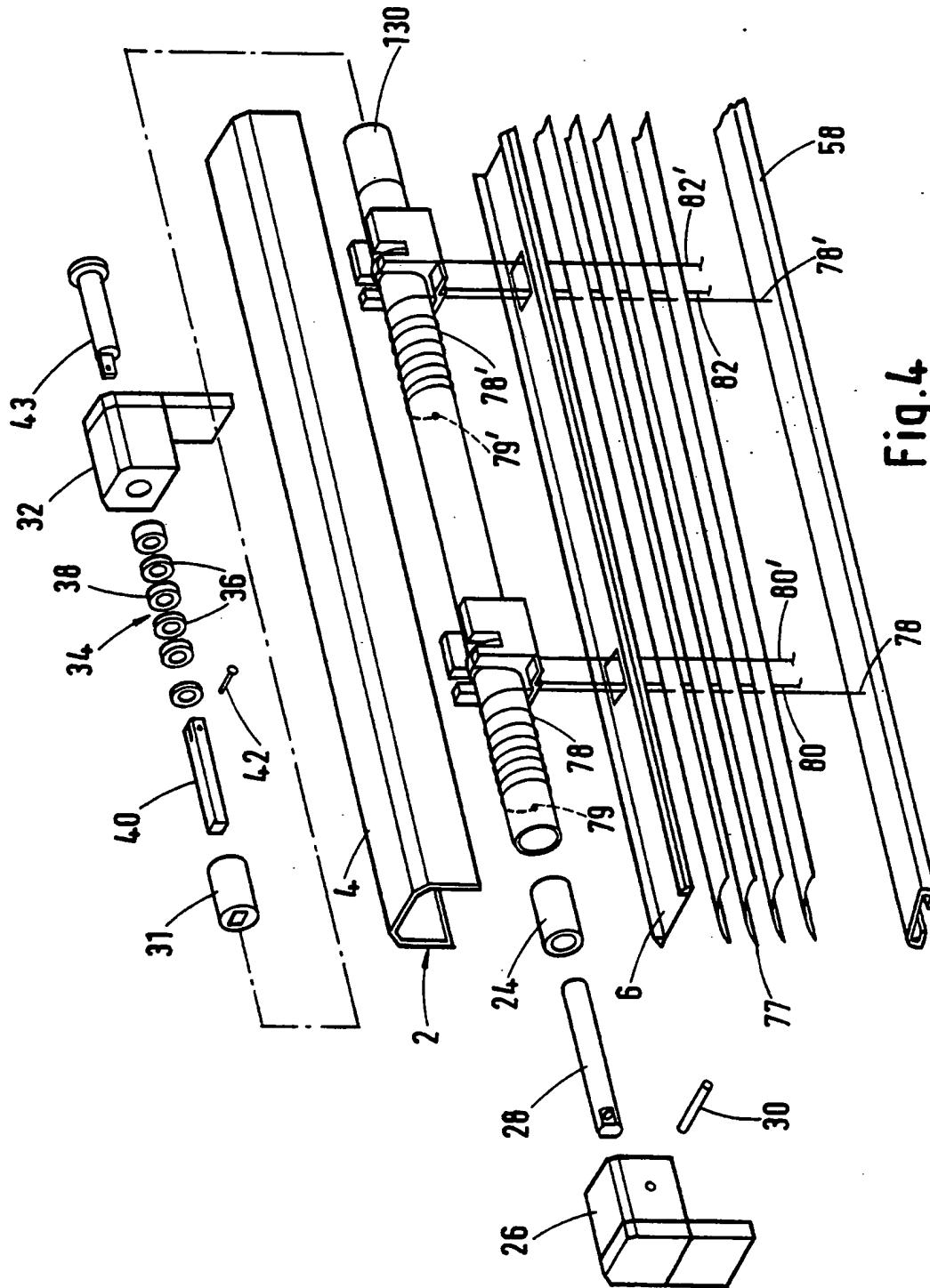


Fig. 4

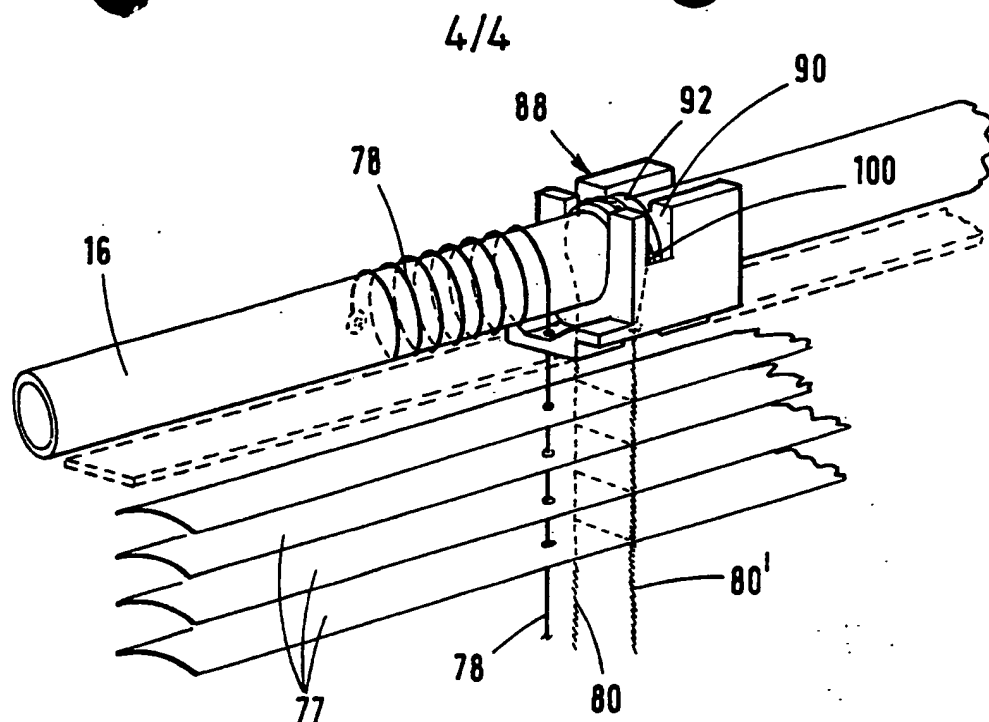


Fig. 5

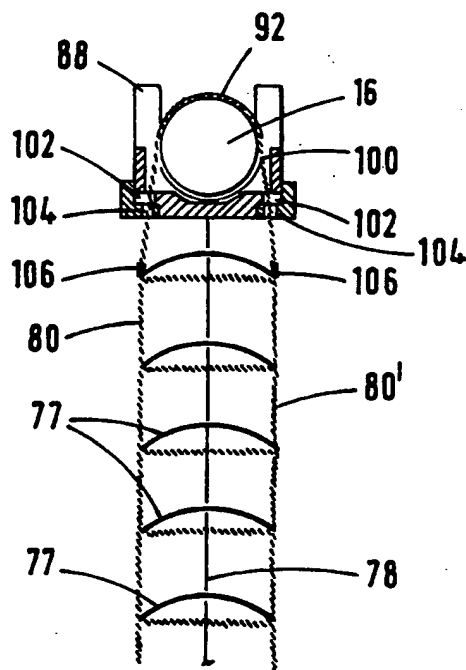


Fig. 6

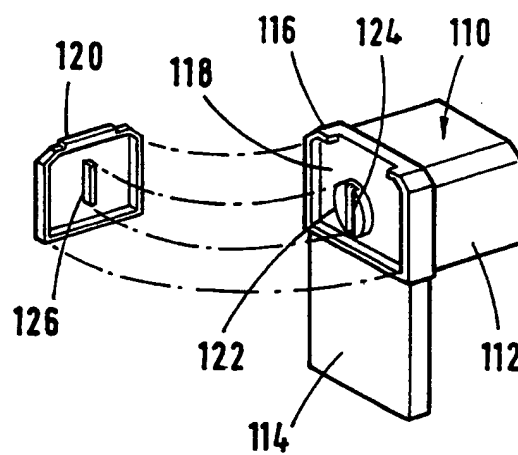


Fig. 7

INTERNATIONAL SEARCH REPORT

International Application No PCT/NO 91/00041

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) ⁶ According to International Patent Classification (IPC) or to both National Classification and IPC IPC5: E 06 B 9/262, 9/32																							
II. FIELDS SEARCHED <div style="text-align: center; border: 1px solid black; padding: 2px; margin: 5px 0;">Minimum Documentation Searched⁷</div> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%; border-bottom: 1px solid black; padding: 2px;">Classification System</td> <td style="border-bottom: 1px solid black; padding: 2px;">Classification Symbols</td> </tr> <tr> <td style="padding: 5px;">IPC5</td> <td style="padding: 5px;">E 06 B</td> </tr> </table> <div style="text-align: center; border: 1px solid black; padding: 2px; margin: 5px 0;">Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched⁸</div> <p style="padding: 5px;">SE,DK,FI,NO classes as above</p>			Classification System	Classification Symbols	IPC5	E 06 B																	
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III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹ <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%; padding: 2px;">Category *</th> <th style="width: 60%; padding: 2px;">Citation of Document,¹¹ with indication, where appropriate, of the relevant passages¹²</th> <th style="width: 30%; padding: 2px;">Relevant to Claim No.¹³</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">X</td> <td style="padding: 5px;">SE, -, 216624 (GRIESSER AG) 31 October 1967, see column 4, line 31 - line 34; column 3, line 19 - line 22 figure 1, detail 10; figure 5</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1,2,6</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">Y</td> <td style="text-align: center; vertical-align: top; padding: 5px;">--</td> <td style="text-align: center; vertical-align: top; padding: 5px;">10</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">X</td> <td style="padding: 5px;">CH, A5, 672658 (STORENSTOFF AG) 15 December 1989, see column 2, line 30 - line 33; column 2, line 17 - line 19</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1,4</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">X</td> <td style="padding: 5px;">SE, B, 311219 (AB NYGEVERKEN) 2 June 1969, see page 1, line 15 - line 16; page 2, line 18 - line 22</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1,3</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">X</td> <td style="padding: 5px;">GB, A, 1081976 (HUNTER DOUGLAS INTERNATIONAL LTD.) 6 September 1967, see column 3, line 39 - line 44 figure 1, detail 15</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1,5</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;"></td> <td style="text-align: center; vertical-align: top; padding: 5px;">--</td> <td style="text-align: center; vertical-align: top; padding: 5px;"></td> </tr> </tbody> </table>			Category *	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³	X	SE, -, 216624 (GRIESSER AG) 31 October 1967, see column 4, line 31 - line 34; column 3, line 19 - line 22 figure 1, detail 10; figure 5	1,2,6	Y	--	10	X	CH, A5, 672658 (STORENSTOFF AG) 15 December 1989, see column 2, line 30 - line 33; column 2, line 17 - line 19	1,4	X	SE, B, 311219 (AB NYGEVERKEN) 2 June 1969, see page 1, line 15 - line 16; page 2, line 18 - line 22	1,3	X	GB, A, 1081976 (HUNTER DOUGLAS INTERNATIONAL LTD.) 6 September 1967, see column 3, line 39 - line 44 figure 1, detail 15	1,5		--	
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<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>[*] Special categories of cited documents: ¹⁰</p> <p>^{"A"} document defining the general state of the art which is not considered to be of particular relevance</p> <p>^{"E"} earlier document but published on or after the international filing date</p> <p>^{"L"} document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>^{"O"} document referring to an oral disclosure, use, exhibition or other means</p> <p>^{"P"} document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>^{"T"} later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>^{"X"} document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>^{"Y"} document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>^{"&"} document member of the same patent family</p> </div> </div>																							
IV. CERTIFICATION <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border-bottom: 1px solid black; padding: 2px;">Date of the Actual Completion of the International Search</td> <td style="width: 50%; border-bottom: 1px solid black; padding: 2px;">Date of Mailing of this International Search Report</td> </tr> <tr> <td style="padding: 5px;">13th June 1991</td> <td style="padding: 5px;">1990-06-18</td> </tr> <tr> <td style="border-bottom: 1px solid black; padding: 2px;">International Searching Authority</td> <td style="border-bottom: 1px solid black; padding: 2px;">Signature of Authorized Officer</td> </tr> <tr> <td style="padding: 5px; text-align: center;">SWEDISH PATENT OFFICE</td> <td style="padding: 5px; text-align: center;">Lena Hagström</td> </tr> </table>			Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	13th June 1991	1990-06-18	International Searching Authority	Signature of Authorized Officer	SWEDISH PATENT OFFICE	Lena Hagström													
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III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
X	CH, A, 400816 (KUENTZ & CIE AG) 30 April 1966, see figure 1, details 17, 18; figure 3 detail 12 --	1,2,5
Y	DE, A1, 3904763 (TORRESAN, ADRIANO) 26 October 1989, see claim 8 -- -----	10

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.PCT/NO 91/00041**

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the Swedish Patent Office EDP file on **91-04-30**.
The Swedish Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
SE--- 216624	67-10-31	NONE	
CH-A5- 672658	89-12-15	NONE	
SE-B- 311219	69-06-02	NONE	
GB-A- 1081976	67-09-06	NONE	
CH-A- 400816	66-04-30	NONE	
DE-A1- 3904763	89-10-26	NONE	